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学位論文題名	Development of Quantitative On-line Concentration Technique for Capillary Electrophoresis by Inkjet（インクジェットを用いたキャピラリー電気泳動のための定量的濃縮法）
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【論文の内容の要旨】

Capillary electrophoresis (CE) has been applied to chemical, biological, environmental and pharmaceutical areas owing to its high resolution and low consumption of sample and reagent. However, further developments in quantitative analysis may be hindered by the conventional injection methods currently in use that give unknown sample volumes introduced. Hydrodynamic injection and electrokinetic injection are two major conventional modes for sample injection in CE. However, the exact volume that is injected into a capillary cannot be accurately determined in either of these injection modes. Furthermore, sample discrimination in electrokinetic injection and the fluctuation of pressure in pressure injection (one kind of hydrodynamic injection) influence the precision of quantitation in CE. In addition, since, in both of these methods, the inlet end of given capillary must be immersed into the sample solutions, residual samples on the tip of the inlet end of the capillary are inevitable, thus resulting in the occurrence of contamination in other subsequent samples during consecutive injections.

To overcome the problem stated above, inkjet injection technique was developed as a quantitative sample introduction method for CE in our lab. And then a quantitative on-line concentration CE method based upon inkjet injection thenique coupled with stacking and sweeping was established. And methylxanthines (theobromine, caffeine and theophylline) were used as model compounds for proof-of-concept. The conditions

for quantitative on-line concentration of CE method was also optimized and evaluated. The injection amount was precisely and freely manipulated by changing the number of ejected sample droplets and the relationships between peak areas and the number of ejected droplets were studied. Under optimized conditions, a linear relationship between the ejected droplet number and peak area was obtained when the droplet number introduced into the capillary was less than 100. Under optimized quantitative on-line concentration conditions, the limits of detection for theobromine, caffeine and theophylline were 1.0, 2.0 and 1.0 μM, respectively. The inkjet injection system was evaluated by comparing it with conventional injection methods. The electropherogram of the inkjet injection mode was the same as that for hydrodynamic injection mode, and no sample discrimination was observed compared with the electrokinetic injection mode. The established method was applied to the determination of methylxanthines in bottled green tea. The recoveries of theobromine, caffeine and theophylline were 94.1, 110.6 and 86.8%, respectively. We conclude that proposed method can be used for quantitative concentration for capillary electrophoresis, thus resulting in an improved accuracy.